



Proven two-way communication
to Venus and beyond



Apollo lunar explorers'
primary link with Earth



For moving targets,
instant recognition and recording

MOTOROLA'S DEEP IN ELECTRONICS EXPERIENCE

...from deep space to deep sea

Tactical ground/air communications
... air-delivered

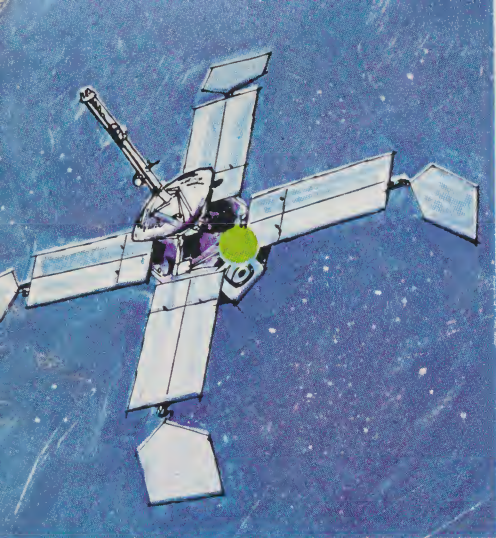


Private radio telephones
for future ground forces

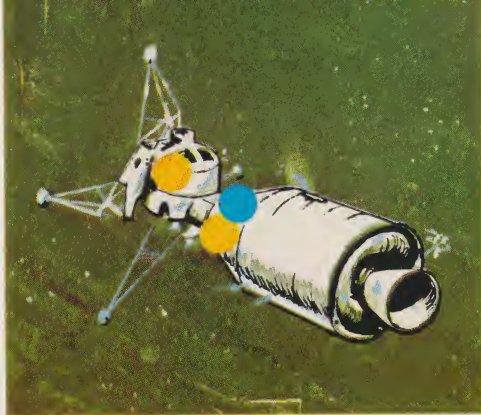


An added dimension
for anti-submarine warfare





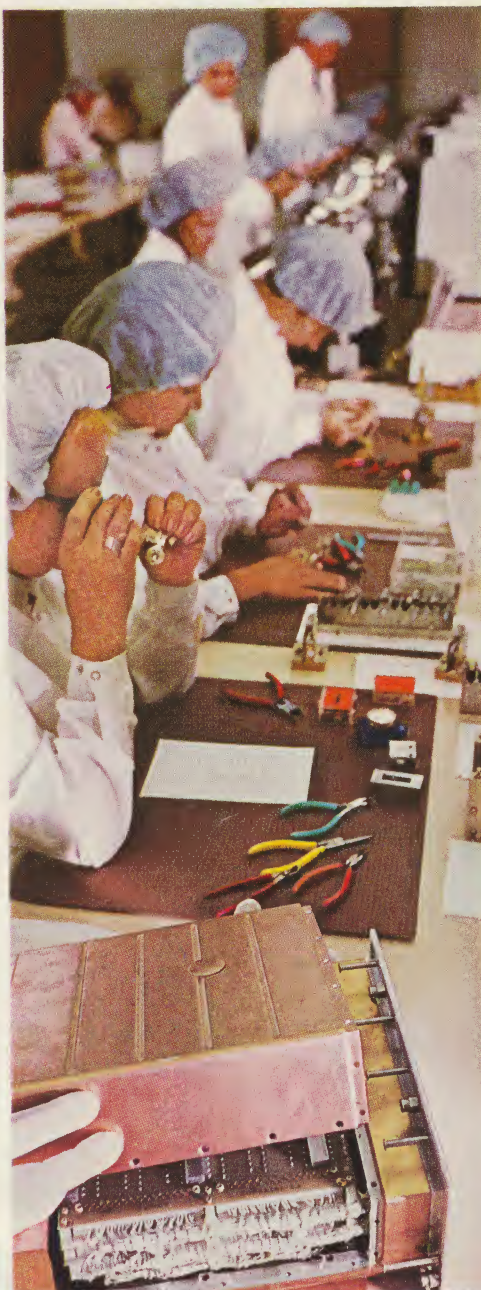
RUGGED, LIGHTWEIGHT BUILDING-BLOCKS. Every Motorola component, module, subsystem and system is designed, tested and retested toward the goal of total reliability. The payoff . . . Mariner II Venus probe signals were successfully received from over 50 million miles in space, under extreme environmental conditions exceeding specified parameters. For deeper NASA/JPL pioneering into outer space, similar equipment provides even greater command capability.



COMMUNICATIONS FOR APOLLO/LEM. Motorola is providing the up-data link and vital communications transponder for the Apollo Spacecraft as well as the transponder for the Lunar Excursion Module. Critical electronic circuitry is assembled in the special, controlled environment of Motorola clean rooms to meet rigid NASA quality assurance specifications.



UNIQUE AIRBORNE RADAR CAPABILITIES. Operationally proven for detecting and recording moving targets, at night and under all weather conditions, Motorola side-looking radar is in use on the Army's Mohawk surveillance aircraft overseas. Another of several Motorola radar systems concepts, used in automatically guiding low-flying, high-speed aircraft over and around topographical obstacles, includes a unique electronic scanning method with a narrow synthetic beam. This system combines the functions of terrain avoidance, terrain following, ground mapping and station keeping. Employment of new integrated electronics application techniques in the heart of the system has made this advanced concept physically practical in size, weight and performance.



EXPERIENCE IN DEPTH... AT MOTOROLA

Programs described on these pages emphasize the broad scope of activities at Motorola's Military Electronics Division... literally from deep space to deep sea.

As a vital part of a large corporation whose sole business is electronics, the Division participates in virtually all areas of advanced electronics systems research and development... from statistical communication theory studies to the application of integrated electronics.

The Military Electronics Division has established a leadership position in the diverse fields of communications & data handling, radar, electromagnetic warfare, undersea electronics, and microwave & antenna systems. Study programs and applied research have been performed proving advanced principles on a broad range of systems... from the dynamics of navigation to multi-user/multi-sensor communications.

In space electronics, the Division has been a major contributor since the early Explorer series. Experience has matured with ever-increasing responsibilities for the sophisticated interplanetary vehicles, Ranger and Mariner, and for the manned space explorations, Mercury, Gemini and Apollo. Contributions have been made on the systems level, as in the Range & Range Rate Satellite Tracking Program, and in the form of precision subsystems, equipment and instrumentation for programs such as Saturn, Polaris, Minuteman, Centaur, Pershing, Scout and Subroc among others.

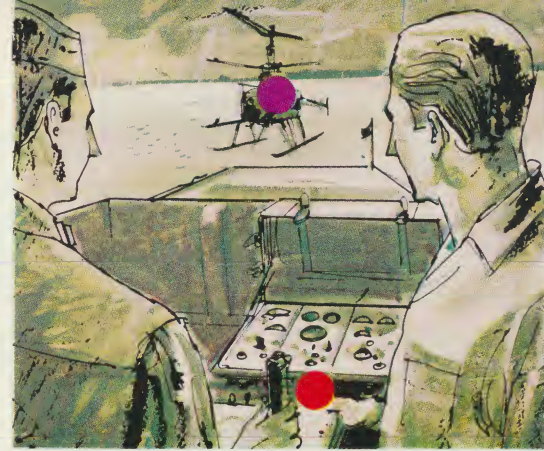
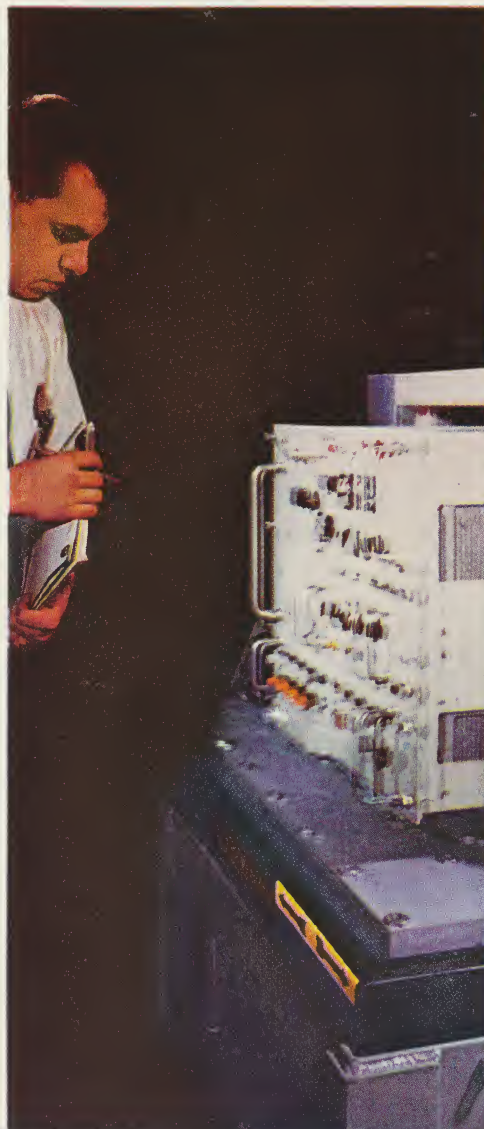
Of the Division's more than 3,500 people, nearly 1,000 are professional engineers or scientists, many with advanced degrees. Facilities encompass over a half-million square feet at two major locations: headquarters at Scottsdale, Arizona, concerned principally with electronic systems for aerospace applications, and the surface and sub-surface systems oriented Center at Chicago.

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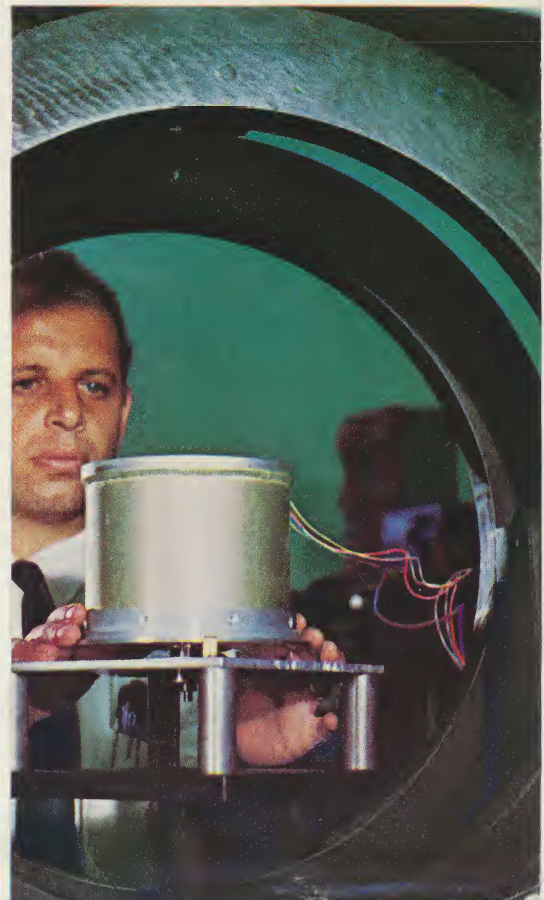
ROUGH AND READY FOR THE NORTH POLE OR THE TROPICS.

Ambient temperatures of -76° to $+158^{\circ}\text{F}$; saturated humidities, sand and dust, salt spray, rain, wind, snow & ice, shock, vibration, bounce and air-drop are taken in stride by the Air Force AN/TRC-87. This easily maintainable, solid state, ground/air VHF communications system, supplied by Motorola, operates unattended in its own shelter hut and can be remotely controlled.



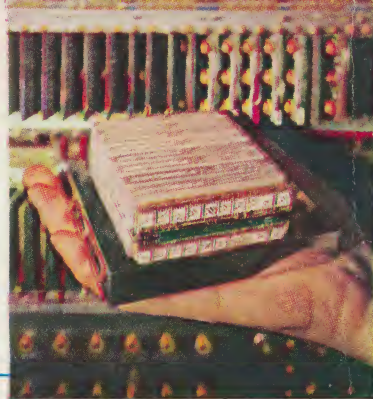
ASW AND UNDERSEA SENSORS.

For the Navy's DASH (Drone Anti-Submarine Helicopter) program. Motorola provided the heart of the command guidance system—shipboard transmitter controls & coders, and airborne decoders—to guide weapons-carrying drone helicopters to precise target locations. And, Motorola's capabilities extend well into the ocean depths; e.g., advanced air-dropped sonobuoys extend the range of underwater sonic detection systems. For undersea navigation, the new Motorola-developed all-electronic Solid State Compass, with no moving parts, provides an accurate and dependable direction reference at extreme depths, even under violent shock or vibration.





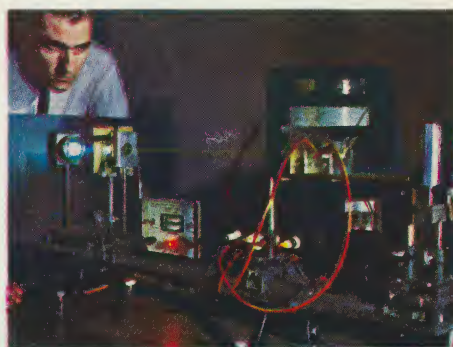
Motorola's experienced technical staff and comprehensive facilities are available to solve your most complex electronics engineering problems. Inquiries regarding specific projects are invited.



ADVANCED COMMUNICATIONS STUDY.

RADEM (Random Access Delta Modulation) is a continuing study program at Motorola to develop a digitally modulated voice and data communications system permitting person-to-person direct-dialing for many users on a common frequency channel. Operational in areas of high interference, the RADEM concept requires no central exchange or fixed nets and is ideal for random access, discrete addresses, high mobility and message security. Extensive application of integrated electronics offers significant advantages in terms of size, weight, reliability and cost.

FORCING THE STATE-OF-THE-ART



INTEGRATED CIRCUIT APPLICATIONS LEADERSHIP

Motorola has demonstrated the fundamental compatibility of semiconductor and thin-film integrated circuit technologies in this Air Force sponsored, air-ground, digital communications system. The result is a new concept in modular assembly for high-density integrated circuit packages.

POLARIZED ELECTRO-OPTICS

Motorola has developed one of the first truly efficient techniques for high-speed deflection of linearly polarized monochromatic light beams. First applications include translating electric signals into optical patterns—such as alpha-numeric data—which may be presented for visual display, hard-copy read-out or further processing.

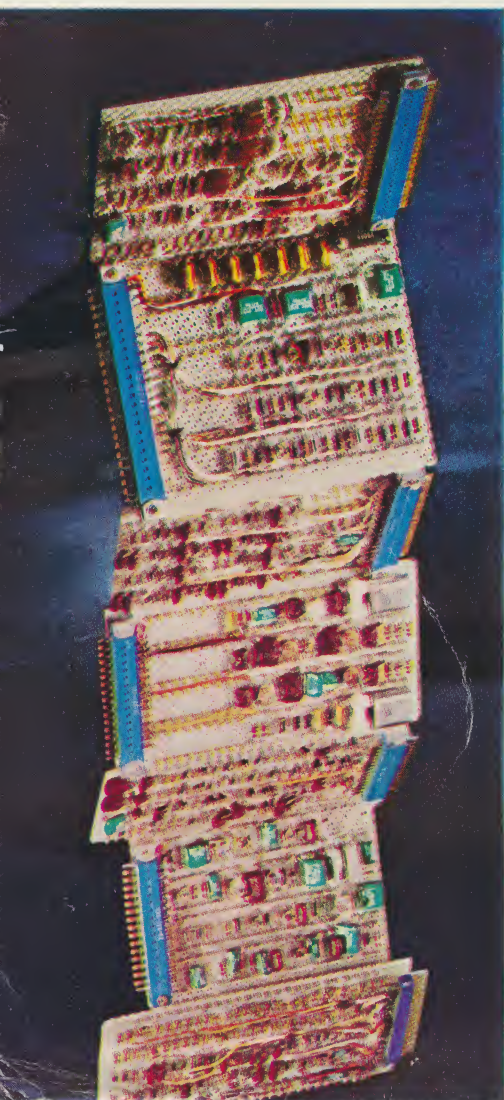
LOW-PROFILE, INTEGRATED ANTENNA

This figure-8 UHF antenna study for the Air Force provides omnidirectional, vertically polarized radiation pattern of a conventional 1/4-wave monopole, yet rises only a few electrical degrees above the ground plane. Miniature transistor oscillator, integrated with the radiating structure, provides a complete antenna-transmitter ("Antennamitter") assembly.



ULTRA-PORTABLE RADAR

This solid-state FM-CW design uniquely combines integrated circuitry, molecular components and circuit commonality. Result: a lightweight, highly portable, ultra-reliable tactical radar system for hand-held field use.



MOTOROLA



Military Electronics Division

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